

Information Bulletin

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Title: Waste Drums Should Be Sampled for Flammable Gases When Venting

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Lessons Learned Summary: Safety Basis controls related to diffusion of volatile organic compounds (VOCs) after venting may not be sufficient for future waste retrieval activities. Sampling for flammable gases at the time of venting, in order to obtain actual data relating to the flammable gases within the drum headspace, would have provided assurance that elevated flammable gas concentrations were not present in the drum void space during the venting and abatement period.

Discussion of Activities: Based on the discovery of elevated VOCs in Transuranic (TRU) Waste retrieved at the Savannah River Site (Reference EM-SR--WSRC-SW&I-2005-0028), Fluor Hanford (FH) performed an evaluation of retrieved waste drum venting activities. The analysis identified specific VOCs and other flammable gases that could be present. The analysis indicated that if the concentration of VOCs in an unvented retrieved drum exceeds the Lower Flammability Level, the current controls established in the Safety Basis may not be adequate. The abatement period, time from venting to attain a safe environment, is based on the time required for hydrogen to diffuse from the drum headspace. It was determined that the abatement period for other flammable gases may be substantially longer than established for hydrogen; thus elevated levels of flammable gases may remain in a drum for an extended period of time.

Analysis: The Safety Analysis used an accident scenario involving a hydrogen deflagration as the bounding accident for all types of flammable gases. Hydrogen was selected because, based on process knowledge, it was expected to be present in a significant fraction of the TRU waste drums to be retrieved.

At the time the Safety Analysis was developed, the available process knowledge indicated a low frequency of significant concentrations of flammable gases in retrieved waste drums. Because waste acceptance criteria would minimize the potential of VOCs and other flammable gases in retrieved waste, the assumption for development of the safety basis was that VOC and other flammable gas levels would be present much less frequently than hydrogen; therefore, a hydrogen deflagration was used as the bounding scenario.

Flammable gases other than hydrogen were assumed to be present only infrequently, if at all, and there was no requirement identified to establish sampling for these gases at the time of venting. During head space gas sampling in preparation for shipment to WIPP, sampling for VOCs occurred. Process information indicated that when VOCs were present they were consistently below the Lower Flammability Levels. It was not possible to analytically back calculate the concentration of the VOCs in the headspace at the time of venting due to the number of variables to be considered. Assurance could not be provided that elevated

flammable gas concentrations were not present in the drum void space during the venting and abatement period.

Recommendations:

1. Organizations performing waste retrieval activities should consider sampling for a suite of flammable gases that could be present in the waste stream at the time of venting in order to obtain actual data relating to the flammable gases within the drum headspace.
2. A re-evaluation of safety basis assumptions should occur when new technical information becomes available, to re-verify the technical basis.

Cost Savings/Avoidance: Not determined

Work Function: Authorization Basis, Packaging and Transportation

Hazards: Personnel Injury/Exposure Airborne Materials Hazardous Materials

Keywords: Volatile Organic Compound, flammable gas, retrieved drums

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References: Occurrence Reports EM-RL--SWOC-2006-0001, EM-SR---WSRC-SW&I-2005-0028

ES&H Safety Bulletin 2006-04 http://www.eh.doe.gov/paa/safety_bulletins/SB_2006-04.pdf,

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